ENERGY CENTER OF WISCONSIN

Final Market Recommendations for Achievable Potential for Energy Efficiency and Renewable Resources in Wisconsin

Recommendations Prepared by
Energy Center of Wisconsin

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1. Background

Through a process of meetings, written comments, and consultations, the Energy Center of Wisconsin proposed 36 markets to study to determine the potential for achievable energy efficiency and renewable energy in the state of Wisconsin. This approach focuses on market opportunities (top-down) rather than end-uses (bottom-up). The Energy Center believes that this approach will yield the richest data for both estimates of quantitative potential as well as qualitative information that will inform program design and behavioral barriers to achieving energy efficiency.

To determine whether these proposed markets constitute a significant amount of energy efficiency potential in the electric and natural gas markets, the Advisory Committee[1] asked that the Energy Center compare this list of markets for energy efficiency with those represented by other recent comparable studies. Because no two studies are exactly alike, or exactly comparable to this study, we reviewed several studies and selected the most recent comparable studies to benchmark the Residential and Commercial and Industrial markets. (We were not directed to do benchmarking of the renewable markets. The agreed upon renewable markets are included for completeness in the Summary section.)

The purpose of the benchmarking study was to calibrate the proportion of the total energy efficiency opportunities represented by the 30 markets we selected. The result would provide an estimate of the coverage provided by the study. We looked at comparable studies of the energy efficiency potential for electric energy, demand and for natural gas therms. We selected studies from similar climate regions and studies that were closest to the definition of "achievable" potential that we are using.

On December 31, 2004, the Energy Center issued a report on the screening and on recommendations for change. We accepted comments on that report until January 10, 2005. This report contains our final recommendations on markets which keeps the scope of the study within the current budget. These recommendations consider both our benchmarking work and the comment from stakeholders. For a full summary of the benchmarking study, please refer to the December 31, 2004 document.

2. Changes to Markets based on Comments on Benchmarking Results

Based on input received in past Advisory committee meetings, we recommend that we keep the number of Residential and Business markets to 30 to make the project manageable within the current scope, budget, and timeframe. Because it is the intent of the Public Service Commission of Wisconsin (PSCW) to update this study on a regular

[1] This committee was appointed by the Governor's Task Force on Energy Efficiency and Renewable Energy to provide oversight to the study.

schedule in future years, it will be possible to add or exchange markets in future studies. In addition, any exchange of markets to increase the potential coverage on either energy or demand or therms will affect the coverage of one of the other measures. We attempted to provide a balance between coverage of all three while trying to include any market that represented over 5% of the potential of a category based on our screening study.

Residential

Based on the screen and on comments, we propose to drop the market for five-plus unit renovation (Market #27), and substitute instead a market comprising homeowner and renter low-cost hot water savers. This market will consider low-cost measures to reduce hot water energy use, including showerheads, faucet aerators, water heater insulation blankets, and pipe insulation in both apartments and homes.

The rationale for this substitution is based primarily on comments from WECC in response to our memo summarizing the market screening exercise. WECC indicated that three significant markets were still being excluded from the study and should be added. These were: (1) the hot-water savers market above, (2) performance improvements to central air conditioners, and (3) refrigerator turn-in programs. We determined that we could remove the rental renovation market will little loss to the study by simply relaxing restrictions on the other rental-sector markets in the study regarding renovation activity. Thus the three rental markets still in the study (heating system replacement, fuel-switching, and common-area lighting improvements) will now include activity associated with building renovation. This frees up room to add one of the three markets suggested by WECC. Of these, the hot-water savers market is the most balanced of these across electric energy and demand and gas energy potential, and is identified as a significant contributor to potential in some of the studies used in the screening exercise.

Commercial and Industrial

As a result of a screening comparison with other potential studies and stakeholder feedback, we concluded that a ventilation system retrofit could yield significant energy savings in the commercial sector, likely higher than other markets currently included in the study. The ventilation retrofit market would include efficient motors, VFD's on fan motors, and improvements to sensors and controls.

The four markets currently covering commercial HVAC are:

- Chiller system improvements (chiller and condenser loop, controls and equipment retrofits)
- Commercial boilers system improvements
- Unitary HVAC end of service replacement (efficiency upgrade of cooling equipment). The achievability of this market is well established by years of program history.
- Unitary HVAC system maintenance (tune-up service focusing on non-functioning economizers, sensors, control settings, and refrigerant charge). The energy saving technical potential of this market is reported to be much greater than savings through unitary efficiency replacement; however, program efforts to capture the

savings have had difficulty creating an effective market.[2] Studies have suggested it is more cost-effective to reduce the significant energy waste of poorly functioning unitary equipment by improving practices in component specification, installation, and start-up practices, rather than by remediation of a continuing stream of poor installations.[3]

We propose that a market targeting ventilation system retrofits be added to the study, replacing the Unitary HVAC system maintenance market. Concurrently, we propose the scope of the Unitary HVAC end of service replacement be expanded in scope to address proper sizing, high efficiency unit specification, premium economizer specifications, proper controls, improved installation practices, acceptance testing and set-up, and owner/operator training.

2. Prior Change Recommendations

For the sake of completeness in a single document, we repeat the recommendations for changes to the original markets based on comments prior to the market screen and based on the findings from the Screen.

Commercial and Industrial
Combine the two New Construction markets into a single market so that the industrial motor end of service replacement market could be added; add lighting replacement to the commercial alterations (lighting remodeling) and expand to include industrial; and add industrial to the commercial lighting retrofit market.

Residential
Delete 1-4 unit rental remodeling, 1-4 unit rental refrigerator purchase, and 5+ unit refrigerator purchase. In the place of these markets, substitute:

- Retrofit Homeowner building shell improvements (This market considers program approaches to encourage homeowners to undertake building shell improvements for space heating and cooling savings. It does not cover improvements undertaken as part of home remodeling, which are considered separately in Market #25.)
- Retrofit Rental fuel switching (This market embraces programs to encourage the conversion of rental housing with electric space heating or water heating to gas-fired systems.)
- Incremental/Retrofit Dehumidifier early retirement and upgrade on purchase. (This market involves program approaches to encourage homeowners to upgrade to higher efficiency dehumidifiers, or to retire working but inefficient

[2] Northwest Energy Efficiency Alliance, Small Commercial HVAC Pilot Program Market Progress Evaluation Report, No. 1, Executive Summary, Energy Market Innovations, Inc., Report #E04-135, November 19, 2004 and
New Buildings Institute, Review of Recent Commercial Roof Top Unit Field Studies in the Pacific Northwest and California, Alan Cowan, October 8, 2004.
[3] NBI 2004.

dehumidifiers. It may also include the promotion of controls to reduce dehumidifier power draw during peak periods.)

3. Summary

Based on two sets of comments and a thorough screening analysis, we recommend keeping the scope of the study at 36 markets with 15 dedicated to residential markets, 15 to commercial and industrial and 6 to customer-side renewables. Based on the stakeholder input to the screen, we modified several markets to make them more robust and substituted some markets where the potential appears greater than markets in our initial recommendation.

Because this study is not a review or evaluation of the current Focus on Energy Program, we did not attempt to match current programs but, instead, attempted to encompass broad market opportunities that would give guidance to future administrators where the most fruitful markets exist for energy efficiency savings in Wisconsin. We also were careful to review data, studies and experience on the **achievable** potential in each market to eliminate markets where economic potential is high but barriers or inertia cause the achievable potential to be proportionately less.

The following tables summarize the recommended markets to be addressed in the study, including those for renewable markets. **We ask that the Advisory Committee review this list and contact the project manager, Susan Stratton, with any comments prior to February 4.** Absent comments, the Energy Center staff will proceed with the markets outlined in this summary report.

4. Next Steps

Because of the additional time needed for the screen and two rounds of comments, the initial schedule will be recalibrated and published in February, 2005. The new schedule will include dates for upcoming stakeholder meetings for additional input on each market as well as planned milestone meetings. The Energy Center is currently collecting data and inputs for each market prior to stakeholder meetings to be held in February and March.

Final Proposed C&I Markets

#	Market Sector	Market Type	Market	Market Description
1	Commercial & Industrial	New Construction	High performance building design and construction (excl. industrial process)	Includes High Performance Building Design and Construction, a medium path between state-of-the-art sustainable construction and simple component substitutions, encompassing many measures of whole-building design, but widely adoptable.
2	Commercial & Industrial	Incremental	Unitary HVAC end of service replacement	The market includes unitary HVAC equipment replaced at the time of failure of the existing unit. It also includes the following items at the time of replacement: proper sizing; high efficiency unit specification; premium economizer specifications; proper controls; improved installation practices; acceptance testing and setup; and owner/operator training. We expect that savings/cost will be weighted by population tonnage (3, 7.5, 15, 25 tons) for increasing efficiency of the replacement unit to Consortium for Energy Efficiency Tier 2.
3	Commercial & Industrial	Incremental	Lighting potential lost opportunity markets (remodel, equipment replacement)	Includes commercial remodeling market, and replacement of fluorescent and HID lighting equipment that has reached the end of service life.
4	Commercial	Incremental	Commercial boiler (>300,000 Btuh) system improvements	Includes replacement for gas fired boilers over 300,000 Btuh mainly in health, education, and offices. Also includes controls and commissioning measures of temperature reset, tune-up, steam balance, and vent dampers. Replacement size up to approximately 3,000,000 Btuh.
5	Commercial & Industrial	Retrofit	Lighting & lighting controls retrofit	Includes market potential for a comprehensive lighting retrofit of commercial and industrial fluorescent, HID, and incandescent lighting to best available source. Would include Energy Star compliant exit signs. Study will be careful to exclude incremental lighting upgrades from the market so there is no double-counting.
6	Commercial	Retrofit	Chiller system improvements	Chiller system optimization to accommodate both improved controls and cooling tower measures, and improved chiller efficiency if replacement is included. Does not include optimization of ventilation.
7	Commercial	Retrofit	Ventilation System Retrofits	This market includes efficient motors, VFDs on fan motors, and improvements to sensors and controls.
8	Commercial	Retrofit	Supermarket and packaged refrigeration	Grocery store: display cases, central refrigeration mechanical & control Packaged stand alone refrigeration: Includes solid-door and open reach-in refrigerators and freezers, Beverage merchandisers, Ice-makers.

#	Market Sector	Market Type	Market	Market Description
9	Industrial	Incremental	Motor end of service repair & replacement	Includes the energy savings potential for efficiency upgrade from EPACT standards to NEMA premium efficiency motors. Market intervention would encompass motor management and downsizing when appropriate. Intervention would also encompass improvements in rewind practices for failed motors.
10	Industrial	Retrofit	Compressed air system optimization	Includes a range of best practices measures. Uses market studies to encompass measures including leak detection and repair, reduce system pressure, eliminating inappropriate uses, variable inlet volume or VSD controlled screw compressors, and properly sized and controlled compressor.
11	Industrial	Retrofit	Fan system optimization	Includes a range of best practices measures. Uses market studies to encompass measures including electronic adjustable speed drives, efficient motors, sizing, maintenance, and airflow.
12	Industrial	Retrofit	Pump system optimization	Includes a range of best practices measures. Uses market studies to encompass measures including electronic adjustable speed drives, efficient motors, sizing, maintenance, and flow.
13	Industrial	Retrofit	Manufacturing process retrofits	Will work with Stakeholders to select a limited number of process technologies that represent the best near term opportunities for conversion. Paper industry (several measures), food (ammonia refrigeration), and steam system distribution best practices are the candidate measure categories.
14	Municipal	Retrofit	Water/wastewater operations	Includes a range of best practices measures. Uses market studies to encompass measures including electronic adjustable speed drives, aeration measures, motors, sizing, and maintenance.
15	Agricultural	Retrofit	Dairy, Ag fans, and Ag pumps	Dairy will use a single savings number representative of a package of measures. Will work with Stakeholders to estimate fan (livestock) and pump (non-dairy) savings.

Final Proposed Residential Markets

#	Market Sector	Type of Market	Market	Market Description
16	Residential Consumer	Incremental	Homeowner/renter electronic appliance purchase	This market involves homeowners or renters who are in the market to purchase electronic products such as TVs, computers, etc. Potential estimates will likely primarily involve the promotion of Energy Star labeled alternatives.
17	Residential Consumer	Incremental	Homeowner/renter retail lighting purchase	This market involves homeowners or renters purchasing light bulbs for existing luminaires in homes and apartments, but may also incorporate efficient luminaire alternatives, such as torchieres. Potential estimates will be based on programmatic approaches to increasing the market share of CFLs. Does not include lighting fixtures for new homes, or those purchased for remodeling projects.
18	Residential Rental Property Operator	Incremental	Rental building common-area lighting purchase	This market involves multifamily building operators who purchase lighting products for common-areas in existing buildings. Includes renovation projects. Does not include lighting purchased for new buildings.
19	Residential Homeowner	Incremental	Homeowner furnace replacement	This market involves homeowners purchasing new replacement furnaces. Since most furnace sales in Wisconsin are already high efficiency from a combustion standpoint, potential estimates will concentrate on programmatic approaches to encourage electrically efficient variable-speed models. Does not include systems purchased for new homes.
20	Residential Homeowner	Incremental	Homeowner central AC purchase	This market is defined as homeowners who purchase a new central air conditioning system, either as a new add-on or as a replacement to an existing system. Potential estimates will be based on programmatic options to encourage the purchase of units that are more efficient than the upcoming 2006 SEER-13 federal standard, as well as to encourage installation practices (for all SEER levels) that optimize the performance of new systems. Does not include systems purchased for new homes.
21	Residential Rental Property Operator	Incremental	Rental heating system replacement	This market is defined as multifamily operators who are seeking to replace existing boilers as well as those engaging in renovation projects. Potential estimates will be based on the program options to encourage high efficiency replacements, modular installations, and controls to maximize system performance. Does not include systems purchased for new buildings.
22	Residential Consumer	Incremental	Homeowner/renter retail room AC purchase	This market is defined as homeowners or renters who purchase a new room air conditioner. Potential estimates will be

#	Market Sector	Type of Market	Market	Market Description
				based on program options meant to encourage upgrading the EER of the unit purchased.
23	Residential Homeowner	Incremental	Homeowner water heater replacement	This market is defined as homeowners who are in the market to replace an existing water heater. Potential estimates will be based on program options to encourage upgrades in the energy factor of the replacement unit, switching from electric to gas, switching from atmospherically vented to power-vented units, and the installation of on-demand units. Does not include systems purchased for new homes.
24	Residential Homeowner	Incremental	Single-family, owner occupied new construction	This market embraces the construction of single-family, owner-occupied housing. Potential estimates will be based on program options to encourage more efficient building shells, higher efficiency mechanical systems, efficiency upgrades to appliances, and efficiency upgrades for hard-wired lighting.
25	Residential Homeowner	Incremental	Homeowner remodeling	This market involves homeowners undertaking remodeling projects with energy-related aspects. Potential estimates will be based on program options to encourage shell improvements, insulation additions, window replacement, and air sealing during remodeling as well as efficiency upgrades for appliances and lighting purchased for remodeling projects. Does not include mechanical system replacements, as these are covered in other markets.
26	Residential Homeowner	Incremental/ Retrofit	Dehumidifier early retirement and upgrade on purchase	This market involves program approaches to encourage homeowners to upgrade to higher efficiency dehumidifiers, or to retire working but inefficient dehumidifiers. It may also include the promotion of controls to reduce dehumidifier power draw during peak periods.
27	Residential Homeowner and Rental Property Operator	Incremental/ Retrofit	Homeowner/Renter Low-Cost Hot Water Savers	This market included showerheads, faucet aerators, water heater insulation blankets, and pipe insulation in apartments and homes.
28	Residential Homeowner	Retrofit	Homeowner building shell improvements	This market considers program approaches to encourage homeowners to undertake building shell improvements for space heating and cooling savings. It does not cover improvements undertaken as part of home remodeling, which are considered separately in Market #25.
29	Residential Homeowner	Incremental	Homeowner washer purchase	This market is defined as homeowners who purchase a new washing machine.
30	Residential Rental Property Operator	Retrofit	Rental fuel switching	This market embraces programs to encourage the conversion of rental housing with electric space heating or water heating to gas-fired systems. This includes opportunities associated with renovation.

Final Proposed Renewable Markets

#	Market Sector	Type of Market	Market	Market Description
31	Commercial	Retrofit/New Construction	Solar PV	Customer-sited, grid-connected, including building integrated PV
32	Commercial	Retrofit	Wood Waste	Wood waste for facility heating
33	Commercial	Retrofit	Solar Thermal	Solar thermal domestic hot water
34	Commercial/ Agricultural	Retrofit	Wind	Rural site-dedicated wind generation
35	Agricultural	Retrofit	Biomass	Farm-based anaerobic digesters
36	Residential	Retrofit/New Construction	Solar Thermal	Solar thermal domestic hot water, individual home systems